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FARNSWORTH'S NEW SYSTEM OF ADDITION,

Comprising
A New and Novel Method of making all Arithmetical Calculations, Revolutionizing the Old Methods in the Fundamental Rules of

ADDITION, SUBTRACTION, MULTIPLICATION, AND DIVISION;

Enabling
Any Bookkeeper, Clerk, or Student of Average Ability to become

A LIGHTNING CALCULATOR.

BY

SETH T. FARNSWORTH.

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PREFACE.

The object of this work is to place in the hands of all persons, young and old, who make use of figures, information and instruction which will give them the highest speed, accuracy, and ease in their work.

It explains in language and illustrations so plain as to be understood easily by any one the methods by which "Lightning Calculators" do their work.

The "NEW SYSTEM" will be found, on investigation, certainly no more difficult than the questions and problems submitted to youthful minds in the school-room in the ordinary arithmetics.

This work is the result of eighteen years' practical experience in actual business calculations. The author found that what his friends were pleased to call a "gift of nature," which enabled him to read columns of figures at sight, was only a killful use of ordinary faculties and laws to which he was driven by the necessities of his work. He found, upon analysis, that the principles upon which lightning calculations are made are easy to understand and to apply.

A knowledge of the System may be acquired with much less study than is required to master the ordinary arithmetics in general use.

By the method explained in the following pages all ordinary additions may be read from left to right and from top to bottom, and all ordinary multiplications may be read at sight, with wonderful rapidity and ease and with much less liability to serious error than in the ordinary way. Subtraction and Division are in like manner made easy.

The explanation of this system is, so far as I can discover, entirely original. I have never met any one who knew it before. No "lightning calculator" has been able to explain the system by which he works so that ordinary persons could understand and use it.

My "New System" has been subjected to the severest tests, has received universal endorsement, and is pronounced as very simple and of the highest value.

SETH. T. FARNSWORTH.

Cincinnati, Ohio, 1889.

NOTE TO SECOND EDITION.

The first edition of the "New System of Addition" was issued under difficulties and consequently in a somewhat crude and imperfect form. Its immediate remarkable popularity and success are all the more gratifying under the circumstances. Every intelligent person who read it learned the method at sight and applied it at once. The system is, therefore, a demonstrated practical success. The book is now fully and carefully revised and complete in every respect. It is now also on a sound business basis and may consequently be expected to reach a very large degree of usefulness.

INTRODUCTION.

The general public is more or less familiar with "Lightning Calculators" and "Mathematical Prodigies." As a rule these terms are applied to certain individuals in whom there seems to be an **abnormal** or **over** development of the mathematical faculties. If, in a tree, some of the branches are cut back there is likely to be a more vigorous development of the remaining branches. It is much the same in the human mind. If, from some cause, certain particular faculties are stunted and dwarfed, it often happens that other faculties stand forth in conspicuous proportion. This is true of the so-called mathematical prodigies. It is not so much the case that they actually possess mathematical powers beyond what are possible to most men and what are really acquired by many men; but the remarkable powers they do possess are shown upon a background of almost complete disability, or, at most, of humble mediocrity, in other intellectual directions. This produces such a striking contrast that it becomes conspicuous and attracts attention. The curious crowd around to see the exhibition of such seemingly remarkable powers, and the "lightning calculator" soon 'bursts forth in all the glory of a "Dime Museum Freak."

From such causes as these it has come to pass that a person manifesting extraordinary mathematical powers is set down as a "prodigy," and regarded as a species of curiosity whose remarkable mathematical ability has some mysterious origin and is impossible to men generally. But is it necessary, in reason, that a person who is expert in figures must also be a fool? Is it not evident to every thoughtful mind that any method of rapid calculation, whether by a "freak," or a duly trained and skilled accountant, must have its basis in some law? Nothing in the whole universe of matter, mind, and spirit, comes by chance. All phenomena arise from the orderly workings of unvarying laws. Where the laws work in perfect harmony the results are perfect. Thus, a diamond, a plant, an animal, a rain-bow, is perfect in exact proportion to the uninterrupted and harmonius workings of those laws which produce those particular phenomena. So in the combining of figures and numbers, those combinations are the more rapid and perfect which are the product of the more harmonious and perfect workings of the laws which underly all mathematical computations.

It will be objected that the "lightning calculator" does not make his calculations by any law **because he cannot explain how he does his work.** No more can the champion gourmand explain how he can digest the four or five dozen eggs and other edibles he will devour at one sitting. Yet his stomach will lay hold of and digest such a mess as this as purely according to physiological law as does the delicate stomach of the humming-bird digest its dainty repast of morning dew. For that matter few of us would attempt to explain how we do so ordinary a thing as to remember our own names. Yet we do remember them and, undoubtedly, according to some unvarying law ot mental action.

The claim is often made also that unusual ability in making rapid calculations depends upon some "special faculty" of mind possessed by the "lightning" calculator and not upon some new or skillful way of combining numbers; that is to say, it is a difference of mind and not one of method. The truth is, it is sometimes the one and sometimes the other. But the difference of mind does not go to the extent of the possession of a **special faculty** not shared in common to a greater or less extent by other men. The multiplication table, which is only sport to the civilized school-boy, is an impossibility to the primitive savage.

The notion must be dismissed that all the rapid arithmeticians are to be found among the "freaks" and "prodigies" that are on exhibition and are written about in the papers. There are many persons in .the different counting-rooms and the school-rooms of the country, who, in the transaction of their daily work, do things (this one one thing and that one another) as wonderful as are seen in public exhibitions. There doubtless are thousands of clerks and accountants in banks, offices, and counting-rooms, and of teachers and students in school-rooms, who, by the constant exercise of the mathematical faculty inseperable from their daily work, have each developed some one or more remarkable powers of mathematical calculation. Driven by the very necessities of his position, each of these has devised **some** plan by which he is able to shorten to some extent his laborious tasks and to insure greater accuracy in his work. They do not all do the same things, nor do those that do do the same things all do them in the same way. Driven by the constant pressure of their heavy duties, they are compelled to seek short methods. Here, one catches a glimpse of an **unused law** in numbers and takes advantage of it to make a "short cut." There, another discovers some **new application** of a **well-known law** and establishes another short method. These are matters of common experience and common observation.

It is not a very uncommon occurrence to find an individual who can add two, three, or four columns of figures at a time. Hand to some cashiers, for instance, a number of freight bills or a number of drafts for collection and they will glance them over hastily and give the correct totals. But you will seldom find one of these **who is able to explain his method** in such a way that another person of equal intelligence can take it up and follow it. He has, unconsciously, it may be, developed his short method through the pressure of his work upon him. Necessity is the mother of invention. But this same pressure of work prevents him from, possibly unfits him for, analyzing and understanding the processes by which he does his work. Consequently he is unable to explain it satisfactorily.

The author of this "NEW SYSTEM OF ADDITION" was a clerk of this kind. He filled positions in which he was compelled to handle thousands of dollars daily in cash and accounts and was held responsible for errors. The pressure of work upon his time and strength was very heavy, so much so that he was compelled to seek every means that would shorten his work and aid in securing its accuracy. In the midst of these circumstances he found himself discovering short cuts which greatly abbreviated and facilitated his work. To such an extent was this true that it attracted attention constantly and awakened wonder among his associates. When asked to explain his methods, as was often the case, he found himself, though willing enough, unable to do so. He did not understand the processes of his own mind. In the hurry and excitement of his work, he could not stop to make mathematical and psychological studies.

But, as his attention was turned to the matter from time to time, it became evident to him that any remarkable powers of arithmetical calculation which he might possess did not arise from a "special gift of nature" as his friends were wont to suggest. He felt assured that the unusual abilities possessed by himself and other rapid accountants (in common with the "prodigies" and "freaks") arose only from the special application in the case of each individual of some law or laws of mind and numbers. He recognized the impossibility of any effect arising without some adequate cause. He could not accept a doctrine either of "gifts" or of "accident". He therefore concluded that **what one person could do in such matters another person with the same faculties could do also if he only knew**

how. Going a step further it seemed to him that **any one person with ordinary faculties of mind could do what all other persons together did in this direction if he only knew all the processes used by all of these.**

Finally, leisure giving him the opportunity, he set to work to discover, if he could, the mental and mathematical laws which made it possible to perform the rapid calculations that attracted so much attention to himself and others. He could conceive of no greater boon that could come to the business and educational world than the formulation of some method by which the ordinary processes of calculation could be greatly shortened, and relieved of their burdensome and irksome drudgery.

This is the recognized era of progress. It is an age of rapid processes. Steam and electricity have well-nigh annihilated time and space. Labor-saving machinery, devices, and methods are in use on every hand. It is a time of wondrous change and development. What was current but yesterday is old fogyism, behind the times, to-day. In business, particularly, it is the lightning man and the lightning method that win. It seemed strange, therefore, that with all the change and progress seen in other directions, men should continue to make their ever-increasing arithmetical calculations by the same cumbersome processes that Noah doubtless used in making his measurements for the ark.

Mathematics has always been considered **the exact science.** Other sciences might change, might develop and grow — that is to say, new facts and new laws belonging to them might be discovered. But no change, no new discovery in the facts and laws of mathematics could be expected. Consequently, children go on "doing their sums" and clerks making their calculations by the same tedious processes, as far as the fundamental rules and methods are concerned, as have been in vogue for time immemorial.

The laws governing mathematics are no more fixed than those governing any other science. Every science is of necessity a fixed science. The facts and laws of some sciences—mathematics, for instance — may be better understood than are those belonging to other sciences. I have observed closely and studied out the processes by which I make my own rapid calculations. I have also, as I have had opportunity, watched the work of other rapid calculators to verify my conclusions. I am satisfied that, in the following pages, I have pointed out and illustrated three simple principles upon which, singly or in combination, rapid calculations are based. It is highly gratifying to discover that these principles are very plain and their application within the power of every person. This "NEW SYSTEM" therefore, not only **solves the secret of "lightning calculating"** but **puts it within the easy reach of every clerk and accountant, indeed of every school boy and girl, to become a "lightning calculator".**

The ability to become a rapid calculator depends upon three things:

1. The possession of the necessary intellectual faculties;
2. A knowledge of the proper methods, mathematical and mental;
3. Application.

Any intelligent person will find that **after one reading** of this book he can add **at sight, with ease,** accounts of **four columns** containing from **five** to **eight** items. A little further practice will enable him to add **four to five columns across** and from **ten** to **twenty rows deep** thus **entirely covering all demands of ordinary business.** The extent to which he can develop his powers beyond this will depend upon his natural mental powers and his perseverance in practice. The universal law of mental and physical progress is that the strength of any faculty increases in proportion to its judicious exercise. Achievements **seemingly impossible** may be made along the lines I have marked out by those sufficiently ambitious and persevering.

I show you the well and how to manage the force-pump. You shall have abundant water for the pumping—not without.

As far as such a thing is possible there will be like improvement over the ordinary processes in Subtraction, Multiplication, and Division.

I have made no attempt to elaborate this new system and to carry out its application into all the possible bewildering, multifarious details. I have aimed only to state the principles clearly and to illustrate their application in a plain and simple way. They will be apprehended at sight and applied intelligently without difficulty. There is no learning by rote, and each will find his necessary drill in his daily work.

This system will be taught to all classes of persons. The book will, therefore, come into the hands of beginners and tyros in figures and also of experienced and expert accountants. In order to adapt it fully to the needs of beginners the instructions and examples are simplified beyond the necessities of those more advanced. The latter class must make allowance for this. The book will be no less valuable to them on this account.

If, in the publication of this little book, I shall assist in relieving the business offices and school-rooms of the world of a heavy burden of unnecessary labor and shall aid in bringing arithmetical processes up to the demands of the times, I shall have abundant cause for satisfaction and shall feel that my humble efforts have not been in vain.

S. T. FARNSWORTH.

STATEMENT OF PRINCIPLES.

The first essential for becoming a rapid calculator is, of course, the possession of the necessary mental faculties. These are a "gift of nature." **Ordinary** faculties are sufficient. **Extraordinary** faculties may be of advantage in this direction as in any other, but they are not essential.

The second essential is a "willing mind." It is important to say a word about this, for, while a person is not to be held accountable for the quality of the faculties he receives from nature, he is accountable for the **use** he makes of them. By a **willing mind** is meant a desire and a disposition to learn. A person who conceives that he knows it all already is not likely to learn much.

Mathematics is of necessity a dogmatic science. Its principles are fixed unchangeably. No man need argue with the multiplication table. It is a little difficult, therefore, for some persons to believe that there can be any change from their own ordinary way of making calculations, keeping accounts, or doing anything connected with figures. The **willing** mind is able to free itself from traditional notions and habitual methods, and to seek improvement constantly in every direction. It does not accept any conclusion, plan, or process, simply because it is founded upon customary and long-continued usage. It will **prove all things** and hold fast to that which it finds to be good.

OLD METHOD OF ADDITION.

Let us examine the ordinary process of making an addition. We will suppose that we are in a primary school and that the class in arithmetic is called up to recite. The example here shown is given them.

$$\begin{array}{r}432\\311\\\underline{211}\\954\end{array}$$

Little Johnny, who stands at the head of the class, is called upon to begin the operation. He commences at the bottom of the right-hand column and tediously and laboriously climbs up the three rounds of the ladder, figure by figure, to the top thus: *One* and *one* are *two* and *two* and *two* are *four.* He then writes the result beneath the column. Little Katie, who is next in the class, takes the second column and, with like tedious labor, clambers up, figure by figure: *One* and *one* are *two*, and *two* and *three* are *five*, and writes the figure below. To Robert, who is at the foot of the class, falls the hardest task. With great labor and difficulty he **foots it up** the third column: *Two* and *three* are *five*, and *five* and *four* are *nine.* Thus the sum of the whole is found to be nine hundred and fifty-four.

A CONTRAST.

Now let us suppose that we have a spelling class in this same primary school, and that they have a spelling lesson like this:

four
five
nine

The class is called up to recite, and little Johnny, who again stands at the head, takes the first word, and spells it out, letter by letter, somewhat laboriously, as in the exercise in arithmetic, as follows: *eff o u ar*, which he pronounces, *Four.* Katie takes the next word, and in like manner spells out, letter by letter: *eff i ve e*, *Five.* Robert takes the last word and spells it out: *en i en e*, *Nine.*

READING NUMBERS.

We have freed our minds from the control of traditional usage and have awakened an inquiring spirit. We therefore watch the progress of these two lessons somewhat curiously. We are forcibly impressed with the **striking analogy** existing between the two processes we have just witnessed. We see that little Johnny **foots it across** the first row of letters just as he **footed it up** the first column of figures, or, if you please, he **spelled up** the first column of figures just as he **spells across** the first row of letters, and reaches the same result in each case.

Here then are **two like processes** producing **two like results.** In the spelling class the children are learning to read **letters** and **combinations** of **letters** making **words.** In the arithmetic class they were learning to read **figures** and **combinations** of **figures,** making **numbers.** We note that it is a process of **addition** in each case.

ANOTHER EXPERIMENT.

This analogy interests us greatly. We determine to follow it up and see how it develops as the pupils become further advanced. We step into the high-school department. The class in arithmetic in this room is called. We find that their lesson differs from the lesson in the primary room only in the fact that their example is made up of figures representing larger values, and more of them, arranged in more rows and columns.

432522
324355
215233
122525
43215
222225
35345
1395420

At the head of the class stands Henry, a handsome youth of eighteen, brother to little Johnny whose acquaintance we formed in the room below. We expect, of course, to notice great advancement in this room over the process and work seen in the *a b c* department. We are much surprised, therefore, when Henry, with a striking resemblance to his little brother in feature, voice, and manner, begins **at the bottom of the right-hand column** and **foots** or **spells** it up, **figure by figure,** just as his little brother did in the primary class: *Five* and *five* are *ten* and *five* are *fifteen* and *five* are *twenty* and *three* are *twenty-three* and *five* are *twenty-eight* and *two* are *thirty.* He sets down the 0 under his column and gives the 3 to Jennie, the fine-looking young miss by his side, sister to our down-stairs' friend, little Katie. Jennie, beginning with the 3, **foots** or **spells up** the second column, **figure** by **figure,** in like manner, reports the result as twenty-two, sets down 2 and passès the other 2 to Mary, the third member of the class, another bright young miss, sister to little Robert. She, following the same primary process, laboriously **foots up** the third column, setting down 4 and passing the 2 to carry to Henry at the head of the class again. And so it goes until the example is finished. We are gratified to note the rapidity and the accuracy with which the high-school pupils make additions in these larger amounts, and compliment them and their teacher upon their good work.

ANOTHER CONTRAST.

The teacher invites us to remain and hear their exercise in reading, which we gladly consent to do, since it will enable us to to make further notes concerning the interesting analogy we thought we had discovered down-stairs. We expect, of course, to note like progress, from primary to high-school, in the **reading exercise** to that we have just witnessed in the **lesson in arithmetic.** We have no doubt that the **words** given to the pupils will be **longer,** and that there will be **more of them.** But, inasmuch as we have just seen these older pupils **foot it up the longer columns of figures** successfully, we are prepared to see them **spell out longer words** with like success. But our observation in the arithmetic class certainly has not prepared us for the astonishing exhibition of ability in reading which we actually do witness.

"Henry, you may read the first paragraph please", says the teacher. And, wonder of wonders, Henry rises and, **without spelling out a single word,** without a moment's hesitation, and, evidently with the greatest ease, **fluently, at sight, reads off** the following paragraph:

"The menagerie opened with music from the calliope. Two Bedouin Arabs, a picture of Belial by Angelo, and a tiny chameleon, were first exhibited. My faithful coadjutor, a great connoisseur, stood for some time wrapt in the empyrean beauty of Angelo's brush."

Jennie and Mary are each called in turn and, with like readiness and facility, read off similar paragraphs. We are lost in astonishment. How is it, we wonder, that these young people who, a few years ago in the primary school, began the reading of combinations of letters and the reading of combinations of figures by processes so strikingly analogous, have made this wonderful progress in reading the combinations of letters, but are still **spelling out** the combinations of figures in exactly the same way that they began in the primary arithmetic class?

THE WORD METHOD.

We conclude to investigate the matter further. We make inquiries and observations in other schools. We are gratified to learn that teachers, having turned their attention to the subject, have discovered **a new** and **far better method** of teaching pupils how to read combinations of letters than by the old method of **spelling them out letter by letter.** We find that they have learned that **it is easier** to teach a child **to recognize a word at sight** than it is a **letter,** because a **word means something to him** while a letter is **meaningless.** We are told, that in most primary schools at the present time, children are taught to read by the "Word Method." They are not taught to

spell until they have learned **to pronounce** many **words at sight.** It is discovered that the eye of a little child **will recognize** a **word by its form** as readily as it will a **letter.** Moreover, the infant mind retains a knowledge of a word because it has a definite, specific meaning to him, and, by the association of ideas, he can always recall it. Thus, when he sees the three letters, *C-a-t*, together, having been taught to associate that particular form of word with the idea of a cat, he recognizes it at once and pronounces the word, *Cat.* And so this new principle of reading letters by their combinations has been developed until children are now taught to read with much greater ease and in much shorter time than formerly. The fact is that we become so accustomed to reading written and printed language that the process becomes quite **automatic**, and **a word can be read in less time** and **with greater ease than a letter can be named.** Scientists have demonstrated this over and over again by actual experiment.

THE TWO ALPHABETS.

All **reading** exercises are made up of combinations of the letters of the alphabet, *a*, *b*, *c*, *d*, *e*, *etc.* All **arithmetical** exercises are made up of combinations of the numerical digits, 1, 2, 3, 4, 5, 6, 7, 8, 9, 0. There are twenty-six letters in the reading alphabet, several of them with different sounds and varying significations. There are but ten letters, or digits, in the arithmetical alphabet, and these, in the same positions, always have the same significations.

SIGHT READING.

This little sketch has been given as a suggestion to the inquiring mind. The striking analogy which is here hinted at between the reading of combinations of letters and the reading of combinations of figures is certainly very significant. It at least awakens this inquiry: Since **combinations** of **letters** into

words and **sentences** may be read **so readily** and **rapidly at sight,** is it not possible that, the proper methods being pursued, persons may learn to read **at sight combinations** of **figures** into **numbers** and **amounts with like facility?** The analogy so plainly existing between the two processes of reading **letter** exercises and **figure** exercises gives strong assurance of the existence of the possibility and the probability.

But we are not left to rest upon mere theory in this matter. What is done daily by skilled accountants and "lightning calculators" shows that they have discovered some method or methods by which **figure sentences** are read as readily as are **letter sentences.**

The theory which we developed in our visit to the primary school finds its complement in the actual work of these rapid arithmeticians. It is our task, therefore, to indicate the processes by which combinations of figures may be read as readily and as rapidly as combinations of letters, and by which any person of ordinary intelligence may become a **rapid calculator** as easily as a **rapid reader.**

The examples and the suggestions that have been given—and all common experience—bring us up to a statement of—

THE FIRST PRINCIPLE.

I. **Combinations of FIGURES, like combinations of LETTERS, may be read at sight.**

THE DECIMAL SYSTEM.

While, as we have seen, the processes of combining and reading letters and figures are **analogous** they are not **identical. Letters are combined** into **words** and **sentences** according to **certain forms** and **rules which belong to them peculiarly.** As to what these peculiar forms and rules are it is no part of this inquiry to demonstrate. Indeed, they are sufficiently evident to every reader.

Figures are **also** combined into **numbers** and **problems** according to **certain forms and rules peculiar to them**. It is important that we should know what these are, for it is upon a knowledge of these forms and rules that all processes of rapid calculation are based.

The science of numbers as used in all times and among all nations is a **decimal** system. The ingenuity of man is not able to devise any other system. The decimal system of numbers is one of the products of creation, one of the gifts of providence to mankind, one of the underlying laws or principles upon which the material universe itself is constructed.

The word **decimal** is derived from the Latin word, *decim*, meaning ten, and the term, **decimal system,** means that, in numbers, ten similar units united constitute a new unit of the next higher order. Thus *ten units* make *one ten*, *ten tens* make *one hundred*, *ten hundreds* make *one thousand*, etc. Our United States money system, following this natural law of numbers, is also **decimal** in its character. Thus *ten mills* make *one cent*, *ten cents one dime*, *ten dimes one dollar*, etc.

Now it will be found that **all rapid calculations,** in one way or another, **take advantage of the decimal law of numbers.** But in common practice, little or no use of the term **decimal** is made, while every one is thoroughly familiar with the terms **dollars** and **cents.** We take advantage, therefore, of these terms, which are familiar to all minds, and, by their use, **lead out** or **e-ducate** the mind to the accomplishment of unusual results.

The word **education** is derived from two Latin words which mean **to draw out.** Education then, in its true or philosophical sense, is a process of **drawing out** or **developing** that which is already **within.** In other words, it is an inductive process, a proceeding from the known to the unknown, from facts to generalizations.

The most common arithmetical calculations, those with which every one by practice is familiar, relate to money. If we speak of dollars and cents every one understands exactly what is meant. This, therefore, gives us our starting-point. If any one learns first to perform the operations with numbers representing dollars and cents he can then apply the same principles to **any** numbers, for all numbers follow the same decimal system.

FIGURE SYLLABLES.

In the **combination** of **letters** into **words** use is made of the term **syllable.** In many words there is but **one syllable,** while in the remainder there are **two** or **more syllables.** In the **combination of figures** into **numbers** there is an analogous **syllable** arrangement. It must be borne in mind all the time that **analogy** does not mean **identity.** The natural division of numbers into "syllables" and "words" follows the lines laid down by the decimal law which prevails in numbers. It is not, however, essential to the purposes of this work to go into any extended discussion of numerical syllabification.

It is sufficient to state that, in the initiatory exercises given in this work, all numbers are regarded, for the time being, as consisting of **dollar** and **cent** syllables. Take, for instance, the number 1225. If this were written $12.25, it would read twelve dollars and twenty-five cents. In order to accustom the beginner to the method or idea of **reading figures by their combinations** instead of **alone,** all numbers in these exercises will be regarded **for the time** as made up of **dollars** and **cents,** or, if you please, **dollar** and **cent syllables.**

FIGURE WORDS.

But **syllables** are combined into **words.** Let us get an idea of how **figure syllables** may be combined into **figure words.** Suppose you have two sums of money, one containing 25 cents and the other 30 cents. You write the *two amounts as* shown here.

$$\begin{array}{r} .25 \\ .30 \\ \hline .55 \end{array}$$

Now glance at this, and **by inspection, without pausing to add the columns, call off the total amount.** You read a word of four or more letters **at sight, without spelling it out.** Read the amount of these figures **without spelling them out.** If you are reading the first number **across** you read it **as a whole,** not **figure** by **figure.** So also with the second number, or any number. You read the **two-figure number,** 25, like you read the **two-letter word,** *as*, **at sight, as a whole.** Read the **up and down** combinations **at sight in the same way,** for figures, unlike letters, are combined **up and down** as well as **across.** You can make this particular combination of figures, $\begin{smallmatrix}25\\30\end{smallmatrix}$, mean 55 to your eyes, just as this particular combination of letters, *s-e-n-d*, means to the eye the word which it represents.

Below are some simple **figure words** of this kind to be read for practice. Read the amounts **at a glance,** without footing up in the ordinary way, just as you read each of these words without spelling it out.

34	17	43	63	55	44	14	81	27	62
55	82	24	26	43	25	55	16	31	25

Let us take an example which will give a further simple illustration of this idea. Write it as shown here. The first number, according to our method, contains the **dollar** syllable, 12, and the **cent** syllable, 25, while the second number contains the **dollar** syllable, 21, and the **cent** syllable, 30. Here we have then two numbers to be combined, each containing a **dollar** syllable and a **cent** syllable. To better indicate the two syllables let the example be rewritten in another form.

```
1225
2130
----
3355
```

```
12-25
21-30
-----
33-55
```

Now why not combine the **two dollar syllables** into a **dollar word,** and the **two cent syllables** into a **cent word?** Let *us see if* we can do this. By **inspection** we perceive that the two dollar syllables, when **united,** give us 33 for our dollar word, and the two cent syllables **united** give 55 for the cent word. We now have a **figure sentence** composed of **two figure words.** These two words, when translated into ordinary language, inform us that the result of the combination of the two given numbers is thirty-three dollars and fifty-five cents, ($33.55), or, dropping our **arbitrary dollar** and **cent terms,** to thirty-three fifty-five (3355).

This brings us to a statement of—

THE SECOND PRINCIPLE.

II. Numbers may be read, and combined and read, according to their natural divisions into DECIMAL SYLLABLES.

FIXING THE ATTENTION.

There remains one more principle to be explained and illustrated. This pertains to a law of mental action. There can be no rapid calculation unless there is, for the time, **a concentration upon the problem of those mental faculties which must be employed in its solution.** The attention must be arrested and held. Some method must be devised by which the will can absolutely compel the mental faculties to do the work assigned.

A study of the laws of psychology, either in the text-books or by observation, shows us that the chief factor in chaining the attention is **the introduction of the element of novelty.** Novelty is that which is new. In lifeless or inanimate objects there is sameness—monotony. Such objects grow tiresome. Wherever there is life there is constant change, variety, growth, and, hence, novelty. Such objects always interest—that is to say, they attract and hold the attention.

In order to fix the attention upon an arithmetical problem, *therefore, we will* be much aided by the introduction of some

novel feature, and by **giving the whole process as much semblance of life as possible.** How shall we do this?

Take the number we had above, 1225. We have already shown how we propose to call the 25, the **cent** syllable, and the 12, the **dollar** syllable. This is a **novel idea** and **challenges attention.** By coupling this idea with another novel or unusual feature the attention may be fixed upon any number or problem at any time, to the exclusion of other matters. The other feature consists in assuming a sort of personal relation to, or supervision of, the numbers for the time by the following plan: Place a dot **below** and **between** the syllables as indicated here—1225. Now, in practice, **always assume that you are standing at the point indicated by the dot.** Standing there you consider the number as made up, **not of separate figures,** but of its **dollar** and **cent** syllables. Accustom yourself to look at each of these syllables **as a whole** and **not** at the **separate figures composing it.** Thus, taking your stand at the appointed position, you are able to say at a glance, "I have here twelve dollars and twenty-five cents." You can read the syllable, 12, at a glance just as easily as you could read alone either of the figures, 1 and 2, composing it.

Without further drill or illustration you perceive that you can, by this means, concentrate your attention upon the figures, or syllables, before you. You will appreciate the importance of this apparently simple matter when we get further along.

This matter of thus using the dot is only suggestive. It will be very useful **to those who need it.** If any can proceed just as readily without it, so much the better. A few beginners, inexperienced in figuring, may, at first, have to confine their attention to **single columns.** Others can begin with **two** columns (with or without the dots), while still others may be able to do as the author does, consider **three** columns at once, thus following the natural division of numbers into **periods.**

This brings us to the formal statement of—

THE THIRD PRINCIPLE.

III. The attention must be given wholly, for the time, to the problem under consideration.

SIMPLICITY OF PRINCIPLES.

The objection may be raised that these principles are **simple** and are **well known.**

The fact of their simplicity is not **objectionable** but **fortunate.** Water is **simple** and **well known,** and yet very **useful.**

If the skillful use of these simple principles shall give you a **speed** and **power in arithmetical calculations you never before dreamed of possessing** what care you whether they are simple or profound. Let us rejoice rather that they are so simple as to be comprehended and applied without difficulty.

ADDITION.

Addition is the basis of all arithmetical processes. Subtraction is Addition reversed. Multiplication is a short method of Addition. Division is a short method of Subtraction.

These four processes—Addition, Subtraction, Multiplication and Division—constitute the four fundamental rules of arithmetic. All arithmetical calculations are made by the use of one or more of these processes.

Addition, being the basis from which the other processes are derived, is the more important of the fundamental rules. In practice, **Addition is** always **the most laborious and difficult of arithmetical work.** The other three processes—Subtraction, Multiplication and Division—are comparatively short in their methods. But Addition is, in its nature, a long and tedious process. **Addition is,** moreover, **the rule chiefly used in business.** This "New System" shortens and facilitates the process of Addition, and is, essentially, a Short Method of Addition, and **is thus of the highest practical value.**

From the suggestions already given experienced accountants and teachers would be able to apply with more or less success the three principles which have been laid down. But this book will come into the hands of many boys and girls who have no knowledge of business and accounts and but little experience in figuring. If the statements and illustrations are so plain and simple that this class can understand them, older and more experienced persons will have no trouble with them.

In applying the principles already laid down to the process of Addition there are five points to be borne in mind:

1. Figures are not to be considered **alone,** but each combination **as a whole.**
2. We give no attention to **columns** and **carrying** as in the customary method.
3. Always **begin at the upper left-hand figure** and read **across** and **downward, just the opposite** in every particular **of the old way.**
4. Be **quick** as—" lightning."
5. Be **all attention**—deaf as—" an adder."

HORIZONTAL COMBINATIONS OF FIGURES.

In all single numbers written in figures the figures are combined **horizontally**—that is **in rows straight across.** If one hundred and thirty-five is written in figures it is represented by three figuress combined **horizontally** thus, 135.

From common practice all persons are familiar with writing and reading figures horizontally combined. Hence no discussion of the matter is required here.

The division of numbers, horizontally combined, into **syllables** has already been explained.

VERTICAL COMBINATIONS OF FIGURES.

In **Addition** figures and numbers are to be combined **vertically**—that is **in rows up and down.** If you have twenty-three cents and forty-five cents and you desire to add the two numbers together you write them thus :

.23
.45

Here you have the 2 and the 3, and the 4 and the 5, respectively combined **horizontally,** while the 2 and the 4, and the 3 and the 5, are respectively combined **vertically.**

It is the purpose of this work to enable any one to read this double combination of figures at sight as readily as he reads the combinations of letters and words in this sentence.

As before stated any one can read **horizontal** combinations *at sight from* common practice. But beginners especially will have to learn even more simple **vertical** combinations,

The following exercises are for practice and also for illustration. For practice, take a ruler, or the edge of a sheet of paper or a book, and cover up the answers or results. Then, looking at each of the examples in turn, consider the figures, **not separately,** but **combined,** and read the result of the combination. Beginners must drill on the exercise *until it is as easy to read these combinations of two figures as it is to read combinations of two letters into words.*

1	2	3	4	5	6	7	8	9	1	2	3	4	5	6
1	2	3	4	5	6	7	8	9	2	3	4	5	6	7
2	4	6	8	10	12	14	16	18	3	5	7	9	11	13
7	8	1	2	3	4	5	6	7	1	2	3	4	5	6
8	9	3	4	5	6	7	8	9	4	5	6	7	8	9
15	17	4	6	8	10	12	14	16	5	7	9	11	13	15
1	2	3	4	5	1	2	3	4	1	2	3	1	2	1
5	6	7	8	9	6	7	8	9	7	8	9	8	9	9
6	8	10	12	14	7	9	11	13	8	10	12	9	11	10

The above list embraces **all the additions that can be made** of the digits taken **by twos.** The exercises show two things:

1. **Any** *two* **digits** in combination can always be read **at sight, instantly.**

2. A combination of two digits may amount to *one* ten and over, but **never** to *two* tens. Hence when any two digits are combined there never can be but ~~two~~ one "to carry."

Let us note the effect of these two facts. Let us take, for example, the two amounts we had above, twenty-three cents and forty-five cents. To show both the **horizontal** and the **vertical** combination of the figures let them be written as shown here.

.2-3
.4-5
6-8

You will have **no difficulty in reading the combinations across, and up and down, at the same time.** Instead of saying—mentally or aloud—"*Five* and *three* are *eight*, and *four* and *two* are *six*, total, *sixty-eight*," you will glance at it **from left to right** and say **immediately,** "*Sixty-eight.*" **Do not** consider the 4 and the 2 **separately** but read their **vertical** combination as *six*, just the same as you read the **horizontal** combination of the 2 and the 3 as *twenty-three.* Read the **vertical** combination of the 3 and the 5 in like manner.

But suppose we wish to combine seventy-three cents and forty-five cents. Write the example in the same form. Here we read 11–8, 118, or $1.18.

$$\begin{array}{r} .7\text{-}3 \\ .4\text{-}5 \\ \hline \$1.1\text{-}8 \end{array}$$

Suppose the amounts were thirty-seven and forty-five cents. Then the example would stand thus:

$$\begin{array}{r} .3\text{-}7 \\ .4\text{-}5 \\ \hline .8\text{-}2 \end{array}$$

Glancing at it we have 7-12. But we must think a minute now. This means 7 **dimes** and 12 **cents.** But 12 cents is 1 **dime** and 2 cents. Hence we have 7 dimes, and 1 dime, and 2 cents, or 8 dimes and 2 cents, or 82 cents. That is to say, in our common language, we have, in this combination, 1 to "carry" from the right column to the left.

But we have learned, in a preceding exercise, that **the vertical combination of any two digits never gives more than 1 to carry.** Now note these important facts also—

In this method of Addition only two digits are combined vertically at the same time.

Hence, *There can never be but 1 to carry and that is done with perfect ease and without extra mental effort.*

The next example shows a further complication but raises no difficulty. Suppose we have the two amounts shown here, in cents, to be added. At the merest glance we see there will be 1 to carry from the right-hand column. Therefore we call the left-hand column 12 instead of 11, and the whole result 122, or $1.22.

$$\begin{array}{r} .5\text{-}7 \\ .6\text{-}5 \\ \hline \$1.2\text{-}2 \end{array}$$

It is very important to notice that the ten—the 1 "to carry" —in any combination, **having been taken out of the combination no more attention is to be paid to it.** This may be illustrated in the example we have just had. Beginning to read it on the left, we say, 11. But we note there is 1 to be added from the following column. So we change it and say, 12. Now, passing to the next combination, we do not say—12, when looking at the 7 and 5, for the 1—the ten of that column—**has been considered and disposed of already.** We therefore see **only the** 2, which we unite with the 12 which precedes, thus making the 122 of the answer.

After a 1 coming from a preceding column has once been disposed of give it no further attention.

The following examples are for practice in **vertical** combinations. They are **as difficult as it is possible to make them** but will be found **easy** nevertheless. In practicing, **cover the answers in the book.**

16	28	37	36	55	89	35	95	49	78
21	32	66	78	99	61	87	38	64	93
37	60	103	114	154	150	122	133	113	171

You will see that there is **no possible combination of this character** that is not **easily read.** The chief matter of importance at first is the **ability to concentrate the attention.** Some persons will have no difficulty in doing this. Others will have to secure it by drill. But that is a matter of easy accomplishment for all. That point once gained, to combine figures in this way presents no difficulty. A few days'—in many cases, a few hours'—practice will enable one to add in this way by an **automatic, mechanical,** or "**insensible**" process, just as you read these words without spelling or hesitation. Any one who engages in this **in good earnest** will be not only **gratified** but **surprised** at the ability he will develop.

But, in order to illustrate how this process may be carried further, let us take another simple example. Suppose we have the sums to be added shown in the first example on the side. We see that the result is read as easily with **three** columns as with **two.** We will try the same thing in a different form. By "keeping both eyes open" we read the second example without difficulty.

$1.25
2.30
$3.55
$1.85
2.30
$4.15

The following examples are for further illustration and practice. **Cover the answers.**

$1.55	$1.75	$4.75	$3.75	$8.87
2.25	3.25	3.30	4.45	5.45
$3.80	$5.00	$8.05	$8.20	$14.32

Remember that the great objects to be secured in all these practice examples are **celerity** and **certainty.**

But suppose that our example is in four columns like the one shown here. Glancing at this "with one eye in each direction" we see we have "1 to carry" from the cent side. It is no trouble to say 17 instead of 16 for the dollar side, and so we have the answer, $17.05. You can add **four** columns as easily as **three.**

$12.25
4.80
$17.05

The following examples embrace some as difficult as can be constructed. It should be borne in mind that, in business, cents are nearly always in **multiples of five,** and the additions comparatively easy in consequence. Cover the answers in practice

$12.25	$12.25	$12.25	$12.25	$12.25
4.65	8.50	10.55	10.80	18.55
$16.90	$20.75	$22.80	$23.05	$30.80
$12.20	$12.70	$17.75	$18.85	$18.60
18.80	12.80	12.85	13.05	17.90
$31.00	$25.50	$30.60	$31.90	$36.50
$83.25	$88.25	$88.50	$88.85	$87.65
25.75	25.75	26.75	22.25	23.45
$109.00	$114.00	$115.25	$111.10	$111.10

$ 87.65	$ 87.56	$ 65.78	$ 88.97	$ 97.98
56.85	65.85	78.65	76.58	78.69
$144.50	$153.41	$144.43	$165.55	$176.67

As stated above, part of these examples are as difficult as can be made up. They include the largest digits and the most complicated combinations possible. In addition by this method, no difference how long the account, **only two rows of figures are ever considered at the same time.** Therefore **if you can read the above combinations you can read any you will find anywhere,** either in business, text-books, or drill exercises.

Those already experienced in figuring will be able to read the combinations **at sight.** Beginners may have to practice a little. Go over the exercises **as often as may be necessary** to make reading them easy. No **instruction** can take the place of **effort.**

These combinations **in two rows of figures** may be extended indefinitely (that is to say, **the number of columns may be increased**) and **the results read with no increased difficulty.** The amounts may be increased until the dollars reach the hundreds, the thousands, or the millions. The following examples illustrate this. Those in the first two rows show **how the dot may be used,** as heretofore recommended, to assist in fixing the attention. Those in the last two rows show **how the natural division into periods may be used** for the same purpose.

$112.25	$580.75	$535.43	$1194.58
120.50	125.20	625.22	1015.12
$232.75	$705.95	$1160.65	$2209.70

$2547.28	$6490.90	$ 5637.55
3524.42	2522.20	6584.65
$6071.70	$9013.10	$12,222.20

$12,345.67
7,654.32
$19,999.99

$293,847.55
91,827.35
$385,674.90

$ 987,654.30
239,845.70
$1,227,500.00

$234,567,891.20
456,789,023.45
$691,356,914.65

$1,908,374,655.45
7,382,911,928.35
$9,291,286,583.80

The learner may multiply practice exercises similar to the above as may be necessary outside the book. Book-keepers, clerks, students, etc., will find sufficient drill in their daily work.

It should be noted that but **very few accountants ever have anything in actual practice like the examples last given above.** The great bulk of the actual business of the world is transacted **inside of four or five columns of figures,** and usually **with small figures on the left,** while some of the above examples extend to **ten, eleven,** and **twelve** columns, and **embrace** the **awkardest** and **most difficult combinations of large figures** that can be thrown together. The examples therefore illustrate the extended possibilities of this method. Any one **who can read the above examples, even slowly at the first attempts,** has only to **persevere.** He will **speedily become a rapid accountant.**

Having seen something of what can be done in reading these combinations of figures when extended **horizontally,** we will now see what we can do when they are extended **vertically** also. Let us take this example:

.24
.32
.21

Suppose these figures represent cents. Glance first at the upper two rows. **Strike the center of the combination,** as it were, with your eye. Read it **like you read a word, as a whole,** 56. Having united the first two rows we might **rewrite the example,** thus:

.56
.21
.77

Then, **striking the center** of these two rows, we see that *we have 77. But of* course it is not necessary to rewrite the example, for the 56 **can be carried in the mind** and thus united with the 21.

A very little drill is sufficient to illustrate this fully. Add the following in this way.

33	24	45	30	41	52
25	52	21	46	24	11
41	22	32	22	33	22
—	—	—	—	—	—
99	98	98	98	98	85

But, in practice, as we have seen already, **the combination of two digits often reaches 10** and over. This is illustrated in the next examples. In consequence of the preceding exercises these can be read easily without explanation.

33	41	33	23	34	43
24	26	22	54	23	32
25	19	46	24	88	79
—	—	—	—	—	—
82	86	101	101	145	154
29	38	47	56	34	67
83	44	63	47	45	78
33	51	59	38	56	89
—	—	—	—	—	—
145	133	169	141	135	234

The combinations in these last examples are unusual in practice, and, like others that have been given, are made, purposely, as difficult as possible. Going over them **twice** carefully, **forcing the mind to give attention,** will make them entirely easy. Further practice will soon transfer them to the realm of the automatic, or "insensible," process.

Some persons have more difficulty than others in getting started by this method. These will be assisted in the beginning by adopting the following plan. We will use the examples in **the *first row* above** for illustration.

33	41	33
24—5-7	26—6-7	22—5-5
25—8-2	19—8-6	46—10-1
—	—	—
82	86	101

23	34	43
54—7-7	23—5-7	33—7-5
24—10-1	88—14-5	79—15-4
—	—	—
101	145	154

The figures written on the right of the examples are for reference. In practice they are **not to be written** but **merely spoken.** Looking at the first two rows in the first example you see that **the two figures on the left,** 3 and 2, combine to make 5. At the same time you see that **the two figures on the right,** 3 and 4, combine to make 7. So you say to yourself, *five-seven* (as we have written, them in the illustration), not *fifty-seven.* Carrying these two figures, 5-7, clearly in your mind you look at the next row. Now you see two new combinations, $\begin{smallmatrix}5\\2\end{smallmatrix}$ for the left column, and $\begin{smallmatrix}7\\5\end{smallmatrix}$ for the right. You read the left-hand combination, 7, but, as you read, you note there is 1 coming from the right, and change the result to 8, and, combining this with the figure left in the right-hand combination, you say 8-2, or 82. The operation is much quicker than the telling. Go over the other examples in the same way.

Various other expedients will suggest themselves to the ambitious and intelligent learner, which he may make of considerable assistance to himself.

The following examples extend the process of reading downward. Do not let yourself read them lazily. Be awake, alert, quick, full of attention. A bird can not fly unless it works its *wings.*

33	52	32	41	11	21
25	22	30	24	22	98
41	45	46	33	45	32
24	21	22	52	38	79
123	140	130	150	116	230

33	52	32	44	63	43
41	11	21	52	22	32
25	22	30	36	33	41
24	42	98	35	53	99
41	54	46	52	65	57
164	181	227	219	236	272

14	25	76	47	18	64
32	35	54	84	29	75
37	61	45	77	31	86
44	56	62	36	42	97
25	25	23	25	53	18
46	34	29	66	64	29
70	16	11	45	75	31
268	252	300	380	312	400

These exercises, like those which have preceded them, are not for illustration alone, but for practice also. Therefore some little patience and perseverance are required in going over them. If instructions are followed, any cashier, entry clerk, shipping clerk, book-keeper, salesman, teacher, student—any one in short, making constant use of figures—**will be able, after one reading of this book, to perform all his usual operations by the new method,** and by continuing to use it will, in a few days' time, develop a speed, ease, and accuracy which will surprise himself and associates, will wonderfully lighten his labors, and will greatly increase the value of his services.

We are now prepared for the final step in the process of Addition. We have learned to read **across**, and we have learned to read **downward**—as **separate processes,** as it were. We will now learn the **two together.**

Let us begin with easy and familiar examples. Following out the principles heretofore laid down we will confine our first examples in this attempt to operations in money. Suppose that we have these sums of money to be added together.

$2.32
3.14
2.21
1.32
$8.99

This example is perfectly easy. The main object to be accomplished in it is **to learn to concentrate the attention.** Perform the operation as directed in the preceding pages. The decimal point between the dollars and cents marks off the **syllables** properly. **Place yourself in the midst of the figures and make them talk to you.**

Place your pencil point just below the decimal point in the second number, and, looking to the left and right above, say: "I have five dollars and forty-six cents, (dropping the pencil again) eight ninety-nine." **Do the work rapidly—without hesitation or repetition.**

Take another example as shown here.

$23.20
12.14
24.32
30.22
$89.88

This you will add without difficulty. **You have now done a wonderful thing in figures.** You have added an account **four columns across** and **four figures deep all at once,** something which many persons consider well-nigh impossible. But you are **only just beginning.** A little patient application will now **work wonders.** Let us try a few more examples for practice.

$32.43	$22.25	$23.70	$11.15
21.12	31.25	1.85	32.45
14.20	13.15	12.30	9.10
30.24	23.25	30.25	20.55
$97.99	$89.90	$68.10	$73.25

The following exercises are upon an actual business basis, being taken from deposit tickets, entry and shipping clerks' tabs, ledger accounts, and other such sources.

$ 15.00	$150.00	$250.00	$1250.00
125.50	25.00	5.00	125.00
75.00	50.50	29.75	120.00
300.50	322.50	20.25	500.50
$516.00	$548.00	$305.00	$1995.50

$ 1.25	$ 12.00	$ 1.75	$ 25.00
3.00	8.75	3.00	50.00
10.00	1.50	24.25	5.50
4.50	10.00	13.85	3.75
.25	17.75	2.00	24.00
2.50	2.30	17.00	10.50
5.00	14.00	5.15	25.00
.50	.80	1.00	2.50
$ 27,00	$ 67.10	$ 68.00	$146.25

$130.00	$525.00	$1250.00	$190.00
10.00	50.00	250.00	190.00
125.00	125.40	1250.00	380.00
1000.00	31.20	3.75	2.25
$1265.00	$731.60	$2753.75	$762.25

$ 2.10	$ 15.00	$ 25.75	$250.00
3.00	25.00	35.25	25.00
10.00	1.50	5.00	2.50
4.20	.75	6.15	100.00
3.50	3.00	10.35	2.25
21.00	4.75	8.00	10.50
13.20	30.00	50.50	9.50
8.15	6.50	24.50	300.00
6.75	15.50	15.50	.25
9.10	10.25	10.00	275.25
$81.00	$112.25	$191.00	$975.25

Many other examples made up in a great variety of ways might be given. But these are sufficient for illustration. Those really in earnest and desiring to perfect themselves will find abundant opportunity for practice in their daily work, or in examples they may select from various sources or may make up for themselves.

By keeping up practice in this method **Addition will soon become as easy** and **natural to the accountant** as **reading** is to the **trained elocutionist** or **piano-playing** to the **accomplished pianist.**

A few correspondents have indicated a desire to know how larger examples are added by the use of this system, and we give some of this character, although they will very seldom, if ever, be found in actual practice.

$ 24.50	$ 28.60	$ 34.75
320.75	251.65	370.25
250.20	220.00	2010.00
400.00	361.50	24.50
$995.45		

Taking the first of the above examples as a sample and leaving the other two for the reader to apply what he has learned, we see :

First, the two lines at the top will be read $345.25 at a glance, and the next call will be, uniting next line below, $595.45, and the next, making answer, $995.47.

Again take—

$ 2642.50	$ 42.50
3265.28	265.28
6150.40	6150.40
2723.62	2723.62
$14,781.80	

In the first place we have, reading the first two lines at the top, $5907.78. Combining this with third line makes $12,058.18, and then this result with the last line gives us $14,781.80. You will see that this is in fact simply an enlargement of some of the first examples given by us. After you have added the first two lines you carry one line in your mind as you add the others respectively. **At no one time** are you adding **more than two lines.** Therefore you have **only one thing to do at a time. Keep cool. Don't get excited.** Do **this one thing** before you go at the next and you are all right.

In trial balances, and in some few lines of business, accounts are very lengthy. In such accounts read down as far as you can and write the partial result on a memorandum ; then read further and note down the next partial result; and so on to the end. Then unite the partial results by the same method of reading. Continued practice, of course, makes one able to read down further and further. Some accountants read twenty and more rows of figures.

In adding a number of invoices, freight bills, bank drafts, loose checks, or other accounts, on **separate papers,** if, as you run them through your hands, you find a large one or one which, from any cause, does not unite readily with your total, throw it out until the last or until your total is in such form that it fits in readily.

There is nothing worth so much to an accountant as good practical common sense, ingenuity, "gumption." Cultivate and apply this quality in all your work.

SUBTRACTION.

Subtraction is, from the nature of the operation, a **short** process. Yet subtractions may be made with much **more speed** and **ease** by the application of the principles upon which the New System is based. A few examples will suffice for illustration.

We will begin with something very simple. Suppose we desire to take away **five** cents from **eight** cents. We will indicate the operation by writing the figures in the ordinary way.

8
5
3

In the exercises in Addition we have learned to read figures **by their combinations.** Let us do the same thing in Subtraction. It is just as easy to **inspect** this and note the result **immediately** as 3, as it is to go through the ordinary process and say, "*Five* from *eight* leaves *three*," and then write the figure 3 for the result. Consider the combination **at once, as a whole,** and **determine what it means.**

Any one can make, at sight, any subtraction that can be represented by any two of the digits. It is not worth while to illustrate this.

Let us see how this method of reading combinations **as a whole, at sight,** may be extended in Subtraction. Take these examples :

18	28	38	98	57	85	69
15	15	15	55	22	71	67
3	13	23	43	35	14	2

Subtraction is the **reverse** of Addition. It is a **short** and

easy process, while Addition is **long** and **tedious.** In Addition we have a "**carrying**" process, while in Subtraction there is an **opposite** process, called "**borrowing.**" We have learned the effect of "carrying" in Addition. We will now examine into the effect of "borrowing" in Subtraction.

It is to be noted, in the first place, that Subtraction deals with **only two rows of figures,** or, to put it in another way, with **combinations of only two digits,** at a time. Owing to this fact **there is never but 1 to "borrow,"** in like manner as in the combination of two digits or two rows of figures in Addition there is never but 1 to "carry." This is a matter of common knowledge and needs no illustration.

But let us note the effect of this fact. Suppose we have this example, $\begin{matrix}24\\13\end{matrix}$. It might be written thus, $\begin{matrix}2\text{-}4\\1\text{-}3\end{matrix}$, and the columns be considered **separately.** The subtraction needs no explanation.

But, in order to illustrate the process of "**borrowing,**" let us take an example of this kind, $\begin{matrix}2\text{-}4\\1\text{-}5\end{matrix}$. But we can not take 5 from 4 as indicated in the right-hand column. Hence it becomes necessary **to borrow 10 units, or 1 ten, from the minuend figure in the next column.** If the example is rewritten, **after the borrowing,** it will stand in this way, $\begin{matrix}1\text{-}14\\1\text{-}\ \ 5\end{matrix}$. That is to say, **the figure on the left in the minuend, being diminished by 1, is no longer 2 but 1.** The 1, borrowed from the tens' column, **makes 10 units,** and **increases the number of units to 14.** The remainder of the process need not be explained.

What is shown in the above explanation is, of course, **understood by every school boy.** It is repeated here only for the purpose of calling attention to the fact that **in Subtraction only 1 is ever borrowed.** This being true, in practical work it is *easy "to keep* an eye ahead." When it is seen, as you work from the left, that a figure ahead in the minuend is **short** and must **borrow,** you will **always know** that **the minuend figure next to it** (on the left) **will be decreased by 1** and **by 1 only,** and you can treat it accordingly.

No more need be said. The idea will become perfectly plain in a few examples. **Read the results** in the following combinations—or subtractions—by **inspection**. **Always begin from the left.**

25	25	47	64	86	93
15	19	27	35	49	89

You will perceive from these familiar examples that **the eye detects at once when there is any borrowing** and **adjusts the result to suit the conditions.**

Those **who find it necessary,** may resort to the use of the **dot,** or the **dollar** and **cent syllables,** in beginning to use the New System in Subtraction.

Following this method you may **at first** have to consider **but one column at a time.** But you will find that **in a little while** you can read **two at once** as easily at **one,** then **three,** and so on.

Solve the following examples by this method. **Begin on the left, read rapidly, and write the result, figure by figure, as you proceed.** Any one, in a short time, may subtract correctly in this way **as fast as he can write.** Cover the answers.

$12.75	$31.85	$58.75	$99.85
6.25	9.50	42.20	76.20
$ 6.50	$22.35	$16.55	$23.65
$1428.40	$3575.95	$8754.40	$9638.00
1226.25	1570.05	6853.50	6720.50
$ 202.15	$2005.90	$1990.90	$2917.50

Cover the answers in practicing the following examples. Note down your own answers and compare them with those in the book.

987654321	543219876	918273645
123456789	123456789	827364591
864197532	419763087	90909054

1234567891011121314151617181920
987654321234567890123456789101

246913569776553424028160392819

Stick to it until you can subtract **with perfect ease** and **great speed from left to right.**

MULTIPLICATION.

Multiplication is so much used in business and there are so many bright minds and nimble fingers multiplying every day and under such a high pressure of work that **many short methods of multiplying have been discovered and are in common use.** To review or reproduce these is not the province of this work. These short methods have been called into existence through the necessity, or force, of circumstances, and bear witness to the fact that the stereotyped and fundamental processes taught in the schools, while right, necessary, and indispensable, **do not go far enough,** and **are not equal to the demands of business.**

A careful examination or analysis of **any short process of multiplication** will develop the fact that, in one way or another, **it is based upon one or more of the three principles laid down in the beginning of this book.** Combinations of figures are read out **as a whole** instead of **by the separate digits;** advantage is taken of **the decimal system of numbers;** and **the attention is concentrated** upon the work.

The possible combinations of figures in multiplication are infinite in number. It is **only possible,** therefore, **to indicate how the three principles may be applied in this process** and to leave each one to work out the details in his own particular line of examples.

Most practical accountants have the idea, without any one making the suggestion, of **making a multiplication as a *whole* instead of by the several digits.** Thus they will multiply by 11, 12, 13, and on upward, **in a single line,** as they do by the single digits, 1, 2, 3, 4, 5, 6, 7, 8, and 9.

Most practical arithmeticians understand also that **multiplications can be made from left to right.** But it is only in certain kinds of examples, and, usually, when the multiplicand is short that there is any practical advantage in this method. But these things serve to illustrate the idea of considering each operation in Multiplication **as a whole,** and **reading the result.**

Enough has been said already to show the importance and the possibility of **fixing the attention.** There is no one rule for this that can be applied to all cases in Multiplication. Each one must be left to devise his own methods according to his own needs and circumstances.

The use of the familiar terms, **dollar** and **cent,** will, however, aid much in the application of these principles.

Following these preliminary remarks and general suggestions, we now proceed to illustrate some of the practical operations in Multiplication.

Nearly every short process in Multiplication **has its basis in the decimal system of numbers.** The **basis of most business transactions** is the **dollar, 100 cents.** 100, a **square decimal,** admits of division into a number of **even** parts, called **aliquot parts.** An **aliquot part** of a number **is a number that will divide it without a remainder.** By considering all numbers **on the dollar basis,** or **as made up of dollars** (or multiples of one dollar) and **parts of one dollar,** as the case may be, or of **hundreds** (or multiples of one hundred) and **parts of one hundred, many short cuts** are possible in Multiplication. Indeed, there are, comparatively speaking, but few operations in Multiplication that may not, in this way, be abbreviated more or less.

One hundred cents, or 100 units of any kind, admit of the following **even decimal** divisions:

$\frac{1}{100}$ of 100 = 1
$\frac{1}{50}$ of " = 2
$\frac{1}{25}$ of " = 4
$\frac{1}{20}$ of " = 5

$\frac{1}{10}$ of 100 = 10
$\frac{1}{5}$ of " = 20
$\frac{1}{4}$ of " = 25
$\frac{1}{2}$ of " = 50

There are also a number of **other fractional divisions** of 100 in more or less common use which are not decimal divisions. They are :

$\frac{1}{16}$ of 100 = $6\frac{1}{4}$
$\frac{1}{12}$ of " = $8\frac{1}{3}$
$\frac{1}{8}$ of " = $12\frac{1}{2}$

$\frac{1}{6}$ of 100 = $16\frac{2}{3}$
$\frac{1}{3}$ of " = $33\frac{1}{3}$

The aliquot parts of 100 (or $1.00) in common use then are seen to be :

1, 2, 4, 5, $6\frac{1}{4}$, $8\frac{1}{3}$, 10, $12\frac{1}{2}$, $16\frac{2}{3}$, 20, 25, $33\frac{1}{3}$, 50.

There are other aliquot parts of 100. For instance, $11\frac{1}{9}$ is $\frac{1}{9}$ of 100, and $14\frac{2}{7}$ is $\frac{1}{7}$ of 100. But these and others which might be given **are seldom or never used in practice.** The usual fractional parts of 1 cent used in fixing the price of goods are $\frac{1}{8}$, $\frac{1}{4}$, $\frac{3}{8}$, $\frac{1}{2}$, $\frac{5}{8}$, $\frac{3}{4}$, and $\frac{7}{8}$—that is to say, $\frac{1}{8}$ **is the usual fractional increment in business**; $\frac{1}{9}$, $\frac{1}{7}$, $\frac{1}{6}$, and $\frac{1}{3}$, **are seldom used.** This fact **reduces the number of aliquot parts in common use** and thus **greatly simplifies ordinary business operations.** Now, by taking advantage of these aliquot parts of 100 (or $1.00) and applying the principles heretofore explained, **nearly all ordinary practical operations in Multiplication may be greatly shortened,** and, at the same time, **the work be made more certain.**

The operations in Multiplication, as before noted, are infinite in number and their illustration in full therefore impossible. Sufficient examples are added to demonstrate practically the application of the fundamental ideas here laid down. The idea of *the system once appreh*ended by each operator, he will have little difficulty in applying it in his own work.

The use of the aliquot parts of 100 in Multiplication involves the regular use of Addition, Subtraction, and Division in the operations.

The examples given are in connection with **money** transactions, so as to take advantage of the familiar **dollar** and **cent forms** and **terms. But the principles involved are the same in all calculations** for whatever purpose, for **all numbers are on the same decimal system.**

Suppose that you buy three lots of books, each lot containing 125 books, paying for the first lot $1.00 per book, for the second, 10 cents per book, and for the third, 1 cent per book, what would be the price of each lot? The operation may be presented in this way:

125	books	at	$1.00	$125.00
125	"	"	.10	12.50
125	"	"	.01	1.25

You will notice that **the results themselves** and **the differences in the results are indicated by the placing of the decimal point.** The **figures** are the **same** in each result.

There being 100 cents in a dollar, the cost of the first lot of books is 12500 cents; the second lot costs 1250 cents; and the third, 125 cents. The **placing of the decimal point** in these amounts indicates their reduction to dollars and points off their division into dollars and cents.

We see, therefore, that, **in Multiplication, when the multiplier (or multiplicand) is 100, or some multiple, or a decimal part, thereof, the operation may be indicated,** wholly or in part, **by the placing of a decimal point.**

This principle may be taken advantage of to shorten operations *in other* examples. Take this for illustration: What will

28 pounds of coffee cost at 25 cents per pound?

Write your example as shown here:

$$\begin{array}{r} 28 \\ \underline{.25} \end{array}$$

If the price were 100 cents (or $1.00) per pound the cost would be $28.00 **(indicated by placing a decimal point).** But the price is 25 cents per pound—¼ of $1.00.

Now, in imagination, let us **place two ciphers to the right** of the 28. Then our example would stand thus:

$$\begin{array}{r} 28(.00) \\ \underline{.25} \end{array}$$

The **upper** figures would indicate **the total cost at $1.00 per pound** while the **lower** figures indicate **the actual price per pound.** To get the correct answer we simply **take ¼ of the upper line.** The completed operation would stand thus:

$$\begin{array}{r} 28 \\ \underline{.25} \\ \$7 \end{array}$$

Suppose the price were 26 cents instead of 25. Then the example stands thus:

$$\begin{array}{r} 28 \\ \underline{.26} \end{array}$$

The **aliquot part** of 100 cents or $1.00 **nearest 26 cents** is 25 cents. The price at 25 cents, as illustrated in the previous example, is $7.00. But **the actual price is 1 cent more than 25.** Therefore **the cost at 1 cent must be added.** The operation complete would then stand as shown.

$$\begin{array}{r} 28(.00) \\ \underline{.26} \\ 7.00 \\ \underline{.28} \\ \$7.28 \end{array}$$

If the price were **24** cents **the cost at 1 cent must be subtracted.** The operation would stand thus:

$$\begin{array}{r} 28(.00) \\ \underline{.24} \\ 7.00 \\ \underline{.28} \\ \$6.72 \end{array}$$

Many simple operations of this character are being performed constantly **mentally,** and **the principle is thus lost sight of,** and, **in consequence, is not applied in more complicated operations** in which, however, it would be **of far greater advantage** than in the more simple ones.

Let us take an example a little more complicated. What will be the cost of 164 acres of land at $125.50 per acre? Indicate the operation as shown.

164
125.50

At $100 per acre the cost would be $16400. At $25 per acre it would be ¼ as much—$4100. At 50 cents per acre it would be ½ of $1.00 per acre. Imagine the decimal point and the two ciphers at the right of the multiplicand. One-half of the amount thus indicated would be $82. The whole operation, written out, would appear as shown.

164(.00)
125.50
16400
4100
82
$20582

In **adding** the **partial products** use the **new method.**

Suppose the price were $124.50. Then the 82 must be **subtracted** instead of **added.** The operation would be written as shown.

It should be borne in mind that these operations are **written out** here **only for illustration.** In actual business, after the method is once learned, the operations are, in most examples, **performed mentally.** The two examples given above would, **in actual practice,** be written in this form:

164(.00)
124.50
16400
4100
20500
82
$20418

164	164
125.50	124.50
$20582	$20418

The experienced accountant, working by this method, writes the results in such problem as this "**so quick it makes your head swim,**" and is a **lightning** calculator indeed.

It would seem hardly necessary to illustrate the application of this principle further. Almost all accountants make more or less use of it in practice. The only trouble is that **many do not understand the real basis of the operation** and **do not realize that it is applicable** to **almost every operation in multiplication.** The above examples are sufficient to make these two points plain. Any one with enough intelligence to fill a responsible business position ought to be able to make a constant application of this method in his work.

The **chief** point to consider is **the correct placing of the decimal point.** Study and practice will make this entirely easy and certain.

EXAMPLES IN ALIQUOT PARTS.

For the benefit of beginners we give a set of examples involving all the aliquot parts of 100 (or of $1.00) in common use.

In all these examples we will take for our multiplicand some number, say of yards of cloth, and for the multiplier the respective aliquot parts of 100, representing the price of the cloth in each case.

In multiplying by 100 cents ($1.00), 10 cents (.10), or 1 cent (.01), it is a simple matter of adding ciphers, when necessary, and placing the decimal point correctly. The multiplier being 1 in each case **the digits of the multiplicand** are **the digits of the product.** The operations are represented thus :

124	124	124
1	.10	.01
$124	$12.40	$1.24

In multiplying by 20 cents (.20), or 2 cents (.02), the operation may be performed by **multiplying by 2**, or **by dividing by 5** (20 being $\frac{1}{5}$ of 100), and placing the decimal point correctly. Make $1.00 the basis, and, in imagination, suppose the 124 first to be multiplied by $1.00 and to have the decimal point and two ciphers annexed as shown below. Then you may **multiply by 2,** or **divide by 5,** being sure to place the decimal point correctly in each case, and the results are the same.

124(.00)	124(.00)
.20	.02
$24.80	$2.48

In multiplying by 40 cents or 4 cents you may **multiply**

by 4, or **divide by 25.** The **former** is **easier** and **should therefore be used.** This is ordinary multiplication, thus :

124	124
.40	.04
$49.60	$4.96

In multiplying by 50 cents or 5 cents you may **multiply by 5**, or **divide by 2.** The latter is somewhat easier and is shown thus :

124(.00)	124(.00)
.50	.05
$62	$6.20

In multiplying by 62½ cents or 6¼ cents the easiest method—if you do not multiply direct (as you probably would do in ordinary short examples) is to **divide by 2** (multiply by 50 or 5) and **by 8** (multiply by 12½ or ¼), and **add** the two partial results, thus :

124(.00)	124(.00)
.62½	.06¼
62	6.20
15.50	1.55
$77.50	$7.75

This is a good place to remind the learner afresh that, while the above operations are conducted with **the prices in cents,** the same principle holds in **all operations involving the same figures** whether they relate to **cents** or to **dollars,** or **not to money at all.** To illustrate this we will extend the above example, making the prices $6.25 and $62.50, **still using the same figures** but **expressing other values** as you see. You will note that **the operation is exactly the same,** the only difference being in the placing of the decimal point in the result.

124(.00)	124(.00)
6.25	62.50
620	6200
155	1550
$775	$7750

In multiplying by 8⅓ cents, 83⅓ cents, $8.33⅓, or $83.33⅓, and so on, **divide by 12.**

126(.00)	126(.00)	126(.00)	126(.00)
.08⅓	.83⅓	8.33⅓	83.33⅓
$10.50	$105	$1050	$10500

In multiplying by 1¼ cents, 12½ cents, $1.25, or $12.50, **divide by 8.**

124(.00)	124(.00)	124(.00)	124(.00)
.01¼	.12½	1.25	12.50
$1.55	$15.50	$155	$1550

To multiply by 1⅔ cents, 16⅔ cents, $1.66⅔, or $16.66⅔, and so on, **divide by 6.**

126(.00)	126(.00)	126(.00)	126(.00)
.01⅔	.16⅔	1.66⅔	16.66⅔
$2.10	$21	$210	$2100

In multiplying by 2½ cents, 25 cents, $2.50, $25.00, and so on, **divide by 4.**

124(.00)	124(.00)	124(.00)	124(.00)
.02½	.25	2.50	25
$3.10	$31	$310	$3100

In succeeding examples the "imaginary ciphers" will be left off of the multiplicand.

To multiply by 3⅓ cents, 33⅓ cents, $3.33⅓ cents, and so on, **divide by 3.**

126	126	126	126
.03⅓	.33⅓	3.33⅓	33.33⅓
$4.20	$42	$420	$4200

To multiply by 37½ cents, $3.75, $37.50, and so on, **divide by 4,** and **that result by 2,** and **add.**

124	124	124
.37½	3.75	37.50
31	310	3100
15.50	155	1550
$46.50	$465	$4650

To multiply by 7½ cents, 75 cents, $7.50. $75, and so on, **divide by 2,** and **that result by 2,** and **add.**

124	124	124	124
.07½	.75	7.50	75
6.20	62	620	6200
3.10	31	310	3100
$9.30	$93	$930	$9300

EXAMPLES WITH REMAINDERS.

For convenience in giving the illustrations, the above examples were so selected that the divisions could be made **without remainders. The method applies just as well when the numbers will not divide without remainders.** In business, in extensions or footings, **fractions of cents,** if **less** than ½ are **dropped,** if **more** than ½, are **counted as full cents.**

In the examples above multiplied by 3⅓ change the 126 to 125 and both these points are fully illustrated. The examples would then stand thus:

125	125	125	125
.03⅓	.33⅓	3.33⅓	33.33⅓
$4.166=4.17	$41.67	$416.67	$4166.67

REVERSING.

In practice it is often convenient to **reverse the terms** and to **make the multiplicand the multiplier.** Suppose we are to multiply 124 by 243 or $2.43. Write the example as usual, but, **in performing the operation, use the 124 for the multiplier.** Multiply first by 100, writing below 243; 25 is **the nearest aliquot** to 24; therefore **divide by 4** (to multiply by the 25). Add your two partial products. But this is 1 times $2.43 too much. Therefore, subtract $2.43 and that gives the correct product, $301.32.

124
2.43
243
60.75
303.75
2.43
301.32

For this particular example there is probably a shorter method. It is given in this form to illustrate the application of this method. It is to be remembered also that, in practice, **most of the work** in such examples **is done mentally** and thus the process is much shorter than here indicated.

If the suggestions and illustrations herein given are clearly understood and mastered it will be seen that **most of the practical oqerations of business can be thrown into this system.** Practice will bring perfection in it and the process will soon become **automatic,** or "insensible," and **as rapid as thought.** It is astonishing to see the **lightning-like rapidity** and the **wonderful accuracy** which, even young persons inexperienced in figuring, will develop after a little careful practice in making multiplications by this method.

There are other short methods of Multiplication which do not come altogether within this system. But these, as a rule, apply only to special sets of figures, and not to calculations generally.

The system herein given is, on the contrary, **of general application.** On this account it is impossible, as before stated, to illustrate its infinite forms in use. Let the student of the system but **thoroughly grasp the principles** upon which it is founded and **he will have no difficulty in applying them in his work.**

DIVISION.

Division is the **reverse** of Multiplication. Division **tears down** what Multiplication has **built up.** The terms in the two processes are relatively interchangable. The **Product,** the **Multiplier,** and the **Multiplicand,** in Multiplication, become the **Dividend,** the **Divisor,** and the **Quotient,** respectively, in Division.

The process of Division, like that of Subtraction, is, **from its nature,** a **short** one. The principles laid down in this system lend **ease** and **speed** to the process, however, so far as they apply.

In all work in Division, as in the other rules, **keep the decimal idea in mind.** Look at numbers **not as made up of independent digits,** but of **units, tens, hundreds, etc.** As far as you are able consider each quantity **as a whole** and **not piecemeal.** Base your operations upon **aliquot parts of 100.**

We will begin with the first examples that we had in Multiplication and **reverse the operations.**

Suppose that you buy three lots of books, the first lot costing, at $1 per book, $125, the second lot, at 10 cents per book, costing $12.50, and the third lot, at 1 cent per book, costing $1.25, what would be the number of books in each lot? The operations may be presented in this way:

$125 ÷ $1.00 = 125
12.50 ÷ .10 = 125
1.25 ÷ .01 = 125

You will notice that the operation is simply **the reverse of the one to Multiplication**, and that, **in this as in that, the results, and the differences in the results, are indicated by the placing of a decimal point.**

Take the next example given in Multiplication and **reverse** it. How many pounds of coffee can be bought for $7 at 25 cents per pound?

Write your example in this form:

$$\begin{array}{r|l} 25 & 7.00 \\ \hline & \end{array}$$

To obtain your product in Multiplication you **divided** by 4. To obtain your quotient in Division **multiply** by 4. The completed operation would stand thus:

$$\begin{array}{r|l} 25 & 7.00 \\ \hline & 28 \end{array}$$

This method of **division by multiplication** can be applied **in all cases** where **the divisor is an aliquot part of 100.**

The short methods in Division are indicated in the following table:

To divide by .01, .10, $1, $10, etc., place the decimal point.

To divide by .02, .20, $2, $20, etc., divide direct.

To divide by .04, .40, $4, $40, etc., divide direct.

To divide by .05, .50, $5, $50, etc., divide direct or multiply by 2.

To divide by .06¼, .62½, $6.25, $62.50, etc., multiply by 16.

To divide by .08⅓, .83⅓, $8.33⅓, $83.33⅓, etc., multiply by 12.

To divide by .01¼, .12½, $1.25, $12.50, etc., multiply by 8.

To divide by .01⅔, .16⅔, $1.66⅔, $16.66⅔, etc., multiply by 6.

To divide by .02½, .25, $2.50, $25.00, etc., multiply by 4.

To divide by .03⅓, .33⅓, $3.33⅓, $33.33⅓, etc., multiply by 3.

The learner should turn back to the examples in Multiplication and, wherever any of the **divisors in the above table** have been used as **multipliers,** he should **reverse the operations** and note the result. He may also test the table by any examples that he may make up. This will be good drill in placing the decimal point.

Accountants who are not using this method already will find the above table of value. These will find practice in their regular work.

It should not be forgotten that, while the above table is given in **dollars** and **cents, the principle applies to the same figures in whatever connection they may be used.**

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